

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference CL2203PCT	FOR FURTHER ACTION	See item 4 below
International application No. PCT/US2004/020706	International filing date (<i>day/month/year</i>) 25 June 2004 (25.06.2004)	Priority date (<i>day/month/year</i>) 27 June 2003 (27.06.2003)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant E.I. DUPONT DE NEMOURS AND COMPANY		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).
 2. This REPORT consists of a total of 6 sheets, including this cover sheet.
- In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input checked="" type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Date of issuance of this report 03 January 2006 (03.01.2006)
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PATENT COOPERATION TREATY

REC'D 17 DEC 2004

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From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

13/12

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2004/020706

International filing date (day/month/year)
25.06.2004

Priority date (day/month/year)
27.06.2003

International Patent Classification (IPC) or both national classification and IPC
C07C309/82, C08F14/18, H01M8/02

Applicant
E.I. DUPONT DE NEMOURS AND COMPANY

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2004/020706

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material:
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing:
☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2004/020706

Box No. II Priority

1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. ☐ It has not been possible to consider the validity of the priority claim because a copy of the priority document was not available to the ISA at the time that the search was conducted (Rule 17.1). This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

4. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	5-8,11,13-17,19-22,24,26,27,29-31,33-39,41,42,44,46,47,50-58
	No: Claims	1-4,9,10,12,18,23,25,28,32,40,42,45,48,49
Inventive step (IS)	Yes: Claims	
	No: Claims	1-58
Industrial applicability (IA)	Yes: Claims	1-58
	No: Claims	

2. Citations and explanations

see separate sheet

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Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

Reference is made to the following documents:

- D1:** Database CAPLUS, abstract number 2004:209841 (XP002303652)
& CN 1 349 962 A (Shanghai Institute of Organic Chemistry) 22 May 2002
D2: WO 96/39379 A (Ballard Power Systems) 12 December 1996

1. Subject-matter

The present application concerns trifluorostyrene monomers substituted by one or two fluorosulphonylperfluoroalkyl groups where the perfluoroalkyl group optionally contains oxygen or chlorine (claim 1), homopolymers and certain copolymers prepared from these monomers (claims 5,9), polymer electrolyte membranes prepared from these polymers (claims 18,31), membrane electrodes comprising these polymer electrolyte membranes (claim 32) and electrochemical cells (such as fuel cells) comprising these membrane electrodes (claim 48).

2. Novelty

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-4,9,10,12,18,23,25,28,32,40,42,45,48,49 is not new in the sense of Article 33(2) PCT.

Document D1 discloses the compounds $m\text{-CF}_2=\text{CF-C}_6\text{H}_4\text{-(CF}_2)_6\text{OCF}_2\text{CF}_2\text{SO}_2\text{F}$ (RN 664327-21-3) and $m\text{-CF}_2=\text{CF-C}_6\text{H}_4\text{-CF}_2\text{CF}_2\text{OCF}_2\text{CF}_2\text{SO}_2\text{F}$ (RN 664327-25-7) which fall within the scope of claim 1. D1 also discloses a copolymer of the first of these compounds with trifluorostyrene and 3-trifluoromethyltrifluorostyrene (RN 664327- 26-8). This copolymer appears to fall within the scope of formula (3) of claim 9. Furthermore, D1 indicates that the monomers can be used for the proton exchange resin for the proton exchange membrane of fuel cells. Furthermore, it is implicit that the membrane of D1 is part of an electrode assembly.

It cannot be excluded that the subject-matter of the full publication CN 1 349 962 A will

be novelty-destroying for further claims of the present application.

3. Inventive step

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-58 does not involve an inventive step in the sense of Article 33(3) PCT.

The document D1 is regarded as being the closest prior art to the subject-matter of claims 1,5,9,18,31,32,48 (in so far as it is novel), and discloses a fuel cell comprising a membrane containing a copolymer of $m\text{-CF}_2=\text{CF-C}_6\text{H}_4\text{-(CF}_2\text{)}_6\text{OCF}_2\text{CF}_2\text{SO}_2\text{F}$ with trifluorostyrene and 3-trifluoromethyltrifluorostyrene.

In the absence of any experimental data in D1 relating to the prior art membrane, the problem to be solved by the present invention may therefore be regarded as the provision of alternative polymer electrolyte membranes for use in electrochemical cells.

Independent claims 1,9,18,32,48 lack novelty (see paragraph 2 above) so an inventive step cannot be acknowledged for these claims.

Independent claim 5 concerns homopolymers of the trifluorostyrene monomers of claim 1. Analogous homopolymers are used in fuel cell membranes in D2 (page 2, line 26 to page 3, line 7, where n , p and q are 0). No surprising effect is shown for the homopolymer of the present application and consequently the use of homopolymers cannot be seen as inventive.

Independent claim 31 concerns polymer electrolyte membranes in which the sulphonyl fluoride moiety of the membrane of claim 18 has been converted to sulphonic acid and sulphonimide groups. It is considered obvious to the skilled person that the sulphonyl fluoride groups are hydrolysed to ion exchange moieties in the membranes.

In the absence of any surprising effect in comparison with the teaching of D1, the only features of the membranes of the dependent claims (in so far as they are novel) that could be considered non-obvious are the values $(\text{CF}_2)_r$ and OCF_2CF_2 for R_F .